

## Claims

1. Air conditioning system, in particular air conditioning system having carbon dioxide as refrigerant, particularly for use in a motor vehicle,  
said air conditioning system comprising a compressor, a gas cooler, an expansion valve and an evaporator arranged in series and forming a closed  
5 circuit for said refrigerant;  
said compressor having a compressor capacity control element and said air conditioning system further comprising a controller for controlling said compressor capacity control element and said expansion valve so as to regulate an expansion valve inlet pressure;  
10 said controller regulating said expansion valve inlet pressure by
  - controlling said compressor capacity control element so as to align evaporator air off temperature with a set point;
  - monitoring expansion valve inlet temperature;
  - determining a required expansion valve inlet pressure corresponding to  
15 said monitored expansion valve inlet temperature by means of a control algorithm; and
  - adjusting said expansion valve and said compressor capacity control element together along an iso-capacity curve to said required expansion valve inlet pressure.
- 20 2. System according to claim 1, wherein said control algorithm comprises one or more control parameters chosen from the list comprising:
  - front end air flow;
  - gas cooler air inlet temperature;
  - evaporator air flow;
  - 25 - evaporator air inlet temperature;
  - evaporator air inlet humidity;

- compressor speed; and
  - set point.
3. System according to claim 2, wherein said control parameters are set, estimated or measured.
  - 5 4. System according to claim 2 or 3, wherein said front end air flow is estimated as a function of vehicle speed and fan speed.
  5. System according to any of claims 2 to 4, wherein said gas cooler air inlet temperature is estimated as a function of vehicle speed and ambient temperature.
  - 10 6. System according to any of claims 2 to 5, wherein said evaporator air flow is estimated as a function of blower speed, air temperature door setting, air distribution mode and air recirculation mode.
  7. System according to any of claims 2 to 6, wherein said evaporator air inlet temperature is estimated as a function of cabin temperature, ambient  
15 temperature and air recirculation mode.
  8. System according to any of claims 1 to 7, wherein said compressor is a variable stroke compressor and said compressor capacity control element is a compressor control valve.
  9. System according to any of claims 1 to 7, wherein said compressor is a  
20 variable speed compressor and said compressor capacity control element is a variable speed electric drive.
  10. System according to any of claims 1 to 9, wherein an internal heat exchanger is arranged between said gas cooler and said expansion valve.